

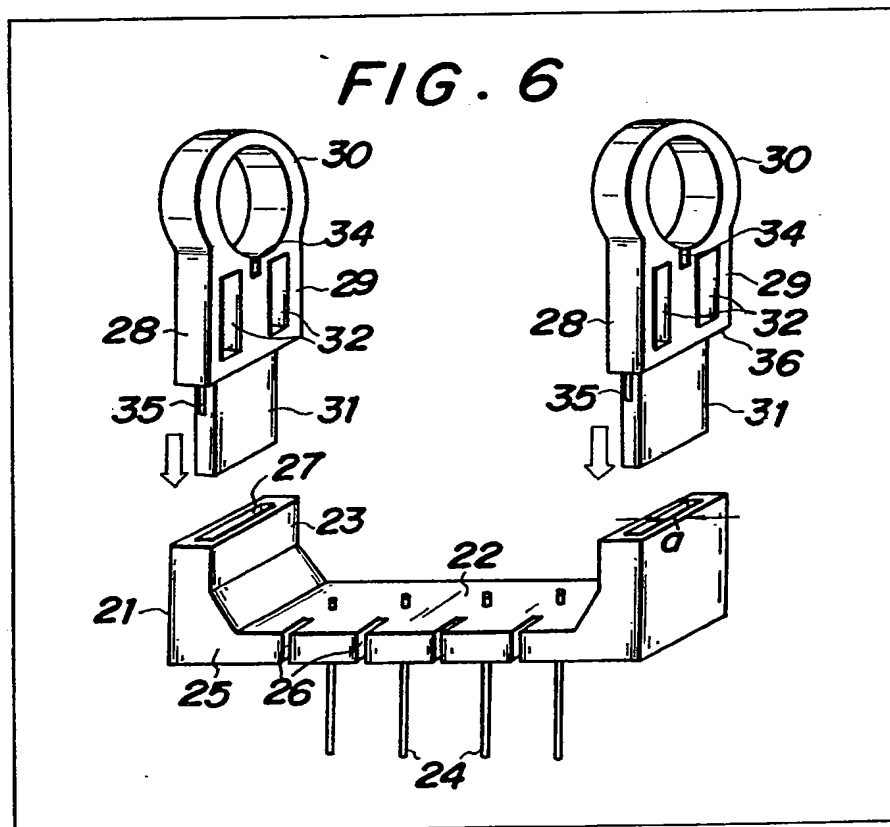
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## (54) Antenna support

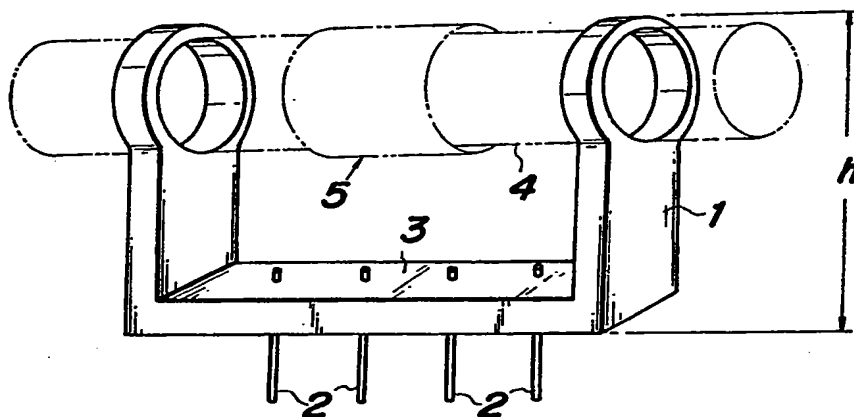
(57) An antenna coil support means for use in radios etc. comprising a heat resistant plastics terminal board 22 which has mountings 23 to which antenna supporting members 28 can be attached. The mountings have poles 27 therethrough into which a connector portion 31 of a respective supporting member can be plugged. In a preferred embodiment the supporting member can have an engagement latch to attach it to the mounting. Other embodiments include antenna supporting members having an integral coil bobbin for the antenna wire.

The separate terminal board and supporting members attempts to overcome the problem of producing one moulding for the whole antenna coil support means, to allow for different sizes of antenna coil and different heights of antenna above the terminal board.

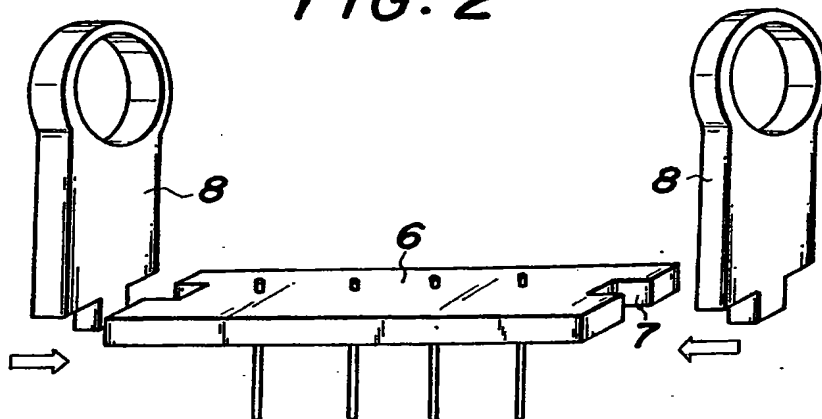


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**FIG. 1**



**FIG. 2**



**FIG. 3**

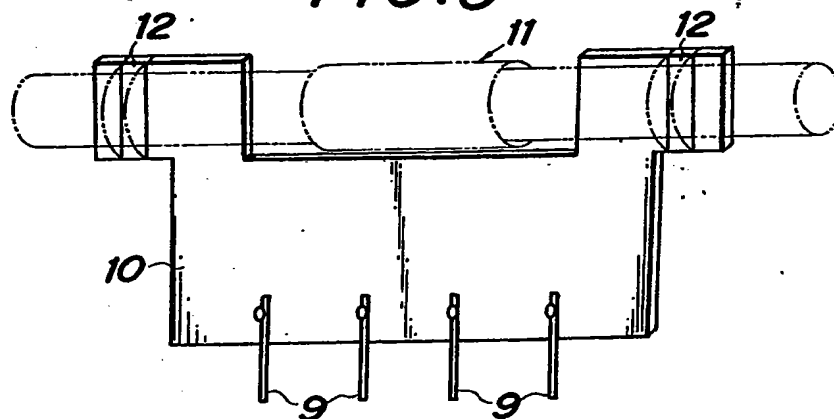


FIG. 4

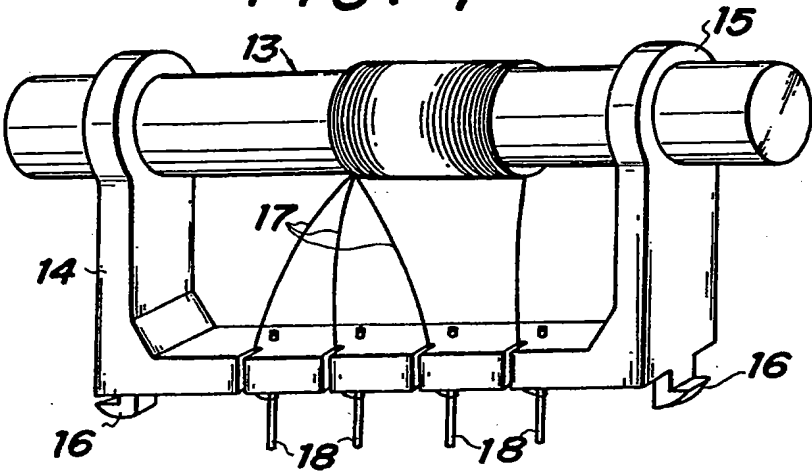


FIG. 5

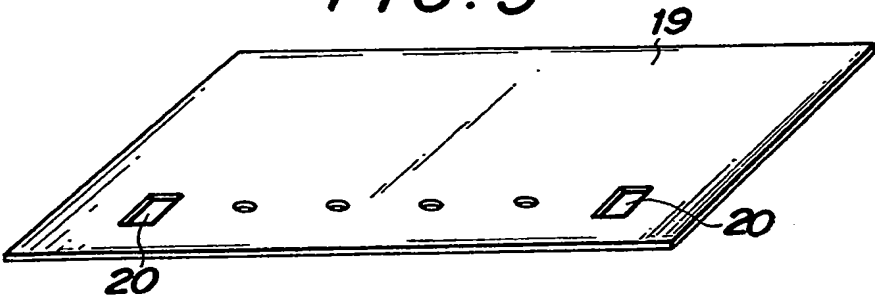
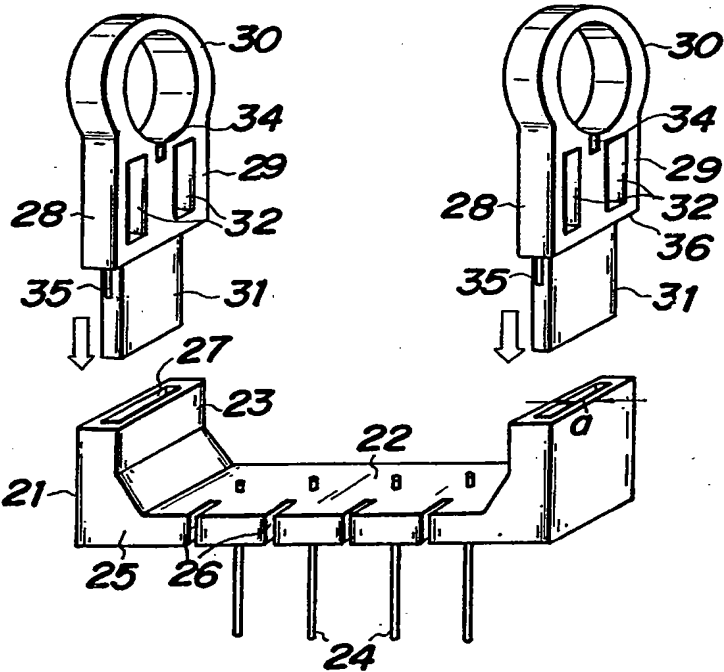


FIG. 6



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FIG. 7

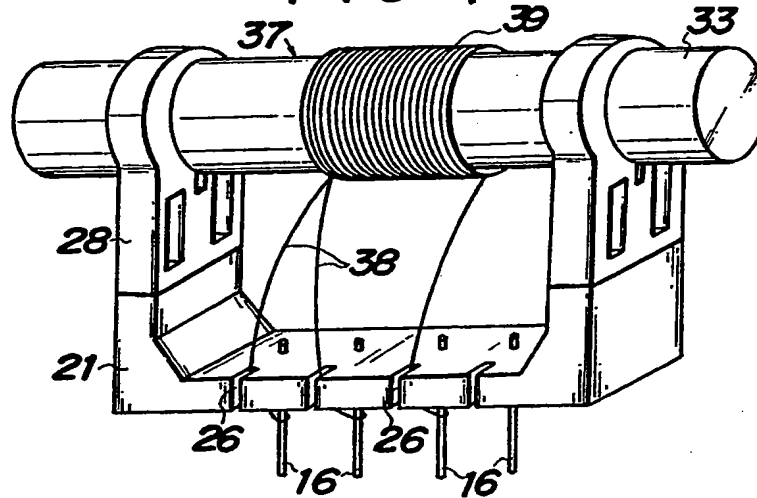


FIG. 8

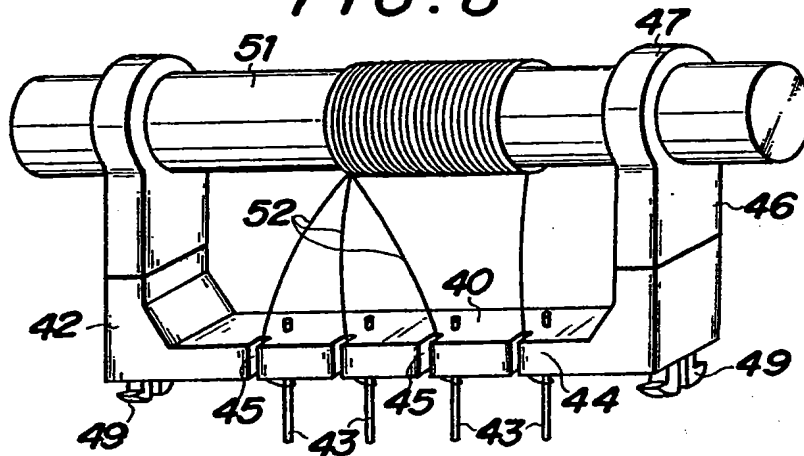


FIG. 10

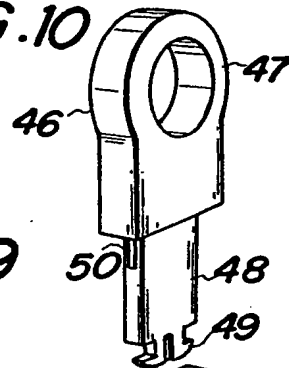


FIG. 9

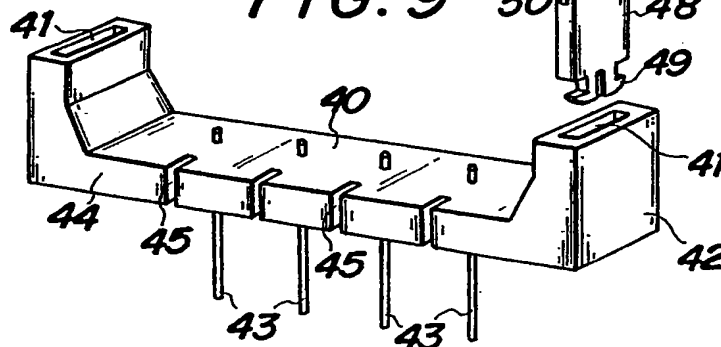


FIG. 11

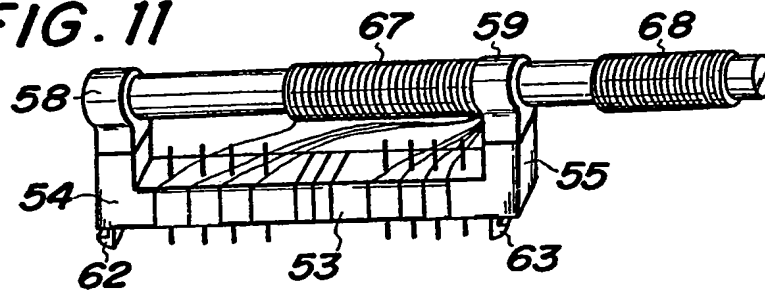


FIG. 12

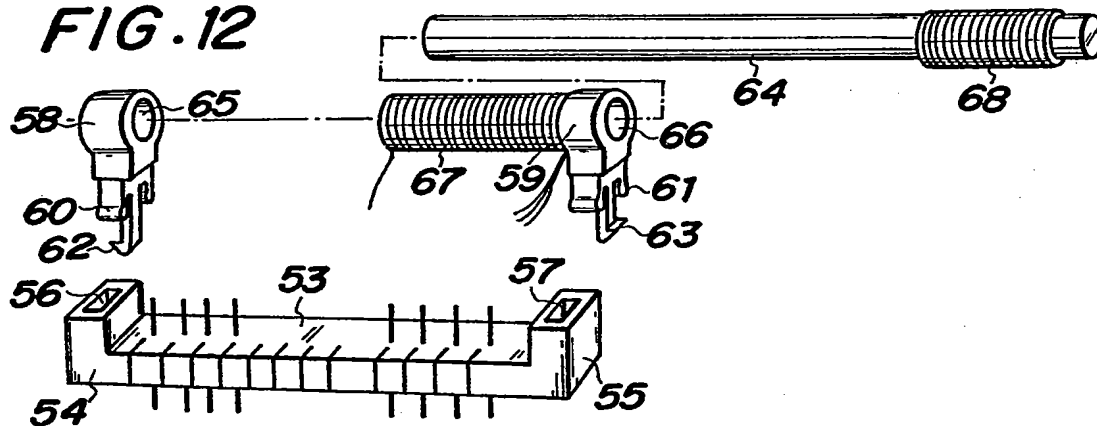


FIG. 13

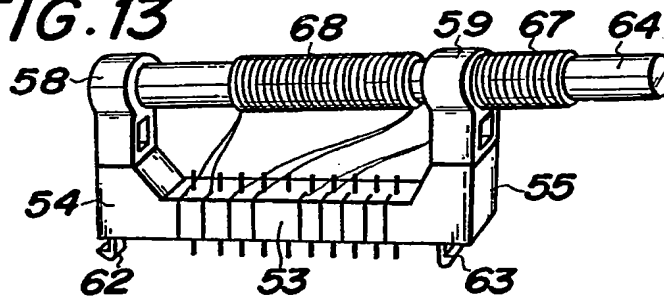
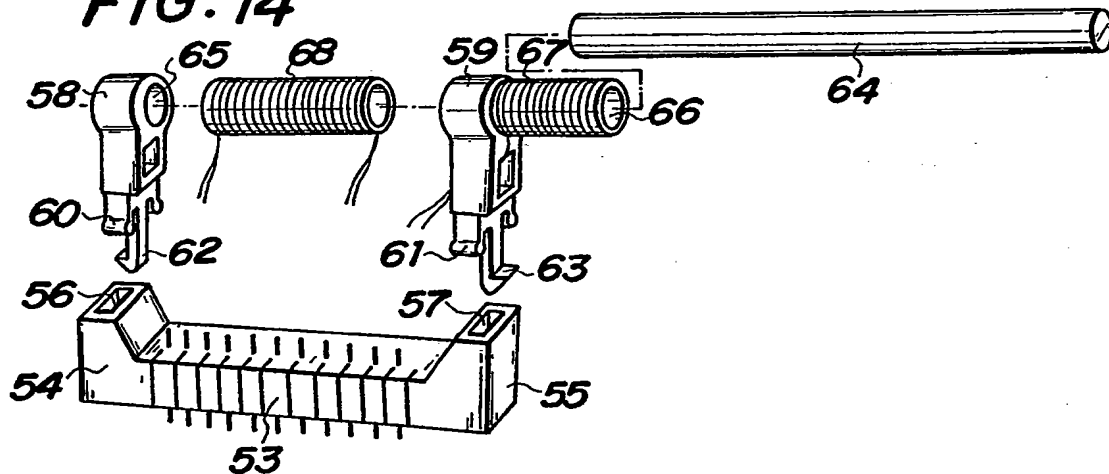


FIG. 14



## SPECIFICATION

### Antenna coil and its support

5 The present invention relates to an antenna coil and its support means, particularly an antenna coil with a terminal board (what so called ferrite antenna) widely used for radio, tape recorder associated with radio or the like, which comprizes substantially  
10 antenna supporting members, mountings for fastening to base board and /or antenna support means.

It has been recognized that the hitherto known antenna coil or antenna support means has a number of drawbacks which are caused by physical, chemical or thermal conditions or other economical conditions inherent to the structure of the hitherto known antenna coil.

Prior to entering the description of the antenna coil and its support means in accordance with the present invention, the conventional antenna coil support will be briefly described below in order to facilitate understanding of the present invention.

One of the typical conventional antenna support means is illustrated in Fig. 1 to 3. The antenna coil support means as shown in Fig. 1 comprises antenna supporting members 1 and a terminal board 2 which is provided with a plurality of terminals, both of said members and board molded integral with each other. It is pointed out, however, that the said antenna supporting member has little shock absorbability, resulting in a drawback that the ferrite core 4 is easily broken, when it falls on the ground. Moreover it is pointed out as additional drawbacks with the hitherto known antenna coil that it has less flexibility to accomodate variation in height  $h$  from the bottom of the terminal plate to the antenna coil 5 or diameter or shape of the ferrite core 4 to be mounted, that assembling is performed with much difficult and that molding dies are expensive to be manufactured.

The antenna coil support as illustrated in Fig. 2 is characterized in that there are provided cutouts 7 at the both ends of the flat terminal board 6, in which the antenna supporting members 8 are fit. The antenna coil as illustrated in Fig. 2, however, has drawbacks that the terminal board 6 and supporting members 8 are easily broken subject to the external force, when it falls on the ground, that it is expensive to be manufactured and that dies for molding them are very complicated and expensive to be manufactured.

The antenna coil support as illustrated in Fig. 3 is characterized in that the antenna coil 11 is mounted on the terminal board 10 with the aid of tape means 12, the said terminal board 10 being provided with a plurality of eyelet type of terminals 9. But it is pointed out that it has drawbacks that the eyelet pieces are easy to be loosened, that the terminal board is often broken and that connection between the antenna coil 11 and the terminal board 10 or between the terminal board 10 and the printed board is unsatisfactorily tight.

Hitherto the antenna coil with terminal board as illustrated in Fig. 4 is put in use in order to simplify mounting of the antenna coil on a printed board. In

the drawing the reference numeral 13 denotes an antenna coil, while the reference numeral 14 denotes a terminal board. The hitherto known antenna coil with terminal board as illustrated in Fig. 4 is constructed such that the antenna coil supporting member 15 and the printed board engagement latch 16 are molded integral with the terminal board 14, the antenna coil 13 is inserted through the said antenna supporting member 15 and the lead wires 17 are connected to the terminals 18 by way of dip soldering. The antenna coil with terminal board as illustrated in Fig. 4 is fastened to the printed board in such a manner as shown in Fig. 5. Namely, the engagement latch 16 is inserted in the engagement hole 20 which is opened in the printed board 19. Thus the antenna coil with terminal board is fastened to the printed board without any danger of being loosened off.

Generally it is required that the antenna coil with terminal plate has heat resistibility enough to stand about 350°C at which temperature the antenna coil is subjected to dip-soldering in a soldering bath. Further it is required that the antenna supporting member 15 has some flexibility for damping shock, because the ferrite core for the antenna coil 13 tends to be easily broken by shock. Normally many thermoplastic resin has flexibility but is very weak against heat, while thermosetting plastics such as phenol resin is high resistant against heat but too hard or fragile. Very little plastic material reinforced with glass fiber or the like has both heat-resistibility and flexibility. Teflon resin is preferably applicable for the purposes but this material is very expensive.

Since plastic materials have such properties as mentioned above, prior to carrying out soldering operation for connecting the coil lead wire to the terminal, some tool or the like should be arranged for the conventional antenna coil with terminal board, by which the engagement latch 16 is held remote from heat source. In case of some plastic material it is found out that the engagement latch 16 tends to tear off.

Further it is pointed out as another drawback with the hitherto known antenna coil with terminal board that in case an antenna rod longer than the terminal board is mounted on the antenna coil with terminal board, the antenna rod is often broken in the vent of dropping or the like because of the fact that a long part of the antenna rod is held unsupported by the terminal board.

An object of the present invention is to provide a new and useful antenna coil support means which is simple in structure and readily adaptable to a variety of operating conditions and moreover advantageously applicable in view of molding die.

Other object of the present invention is to provide a new and useful antenna coil in which the physical, chemical, thermal and economical drawbacks inherent to the conventional as mentioned above ones are completely eliminated.

Another object of the present invention is to provide a new and useful antenna coil in which there is little danger of breakage of the ferrite core mounted thereon.

The above mentioned objects have been accom-

lished in accordance with the present invention by the arrangement that there are provided mountings at the end portions of the terminal board, through which an opening extends in the vertical direction and an antenna supporting member is fit and fastened in the said opening, wherein the terminal board is made of heat resisting material. It is preferable that at the lower end of the insert or connector portion of the antenna supporting member there is provided an engagement latch means in order to facilitate fastening to the base board. Further it is preferable that a coil bobbin is molded integral with the antenna supporting portion of the antenna supporting member.

The above and further objects and novel features of the invention will be more fully apparent from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

The present invention will be now described in detail with reference to the accompanying drawings, in which;

Fig. 1 to 4 is a perspective view of an antenna coil and its support respectively, which is constructed in the hitherto known method.

Fig. 5 is a perspective view of a printed board.

Fig. 6 is a perspective view of an antenna coil support in accordance with an embodiment of the present invention, as shown in the developed state.

Fig. 7 is a perspective view of an assembly of antenna coil and its support in accordance with the present invention, the former being carried by the latter.

Fig. 8 is a perspective view of an antenna coil with a terminal board in accordance with the present invention.

Fig. 9 is a perspective view of a terminal board.

Fig. 10 is a perspective view of antenna supporting member.

Fig. 11 to 14 is a perspective view of an antenna coil in accordance with the present invention respectively, being shown in an assembled state as well as in a disassembled state.

Fig. 6 show an antenna coil support means in accordance with the present invention in the disassembled state, while Fig. 7 shows an assembly of antenna coil and its support, wherein the former is mounted on and carried by the latter.

In the drawings the reference numeral 21 denotes a terminal board made of heat resisting plastics. The said terminal board 21 is substantially consisted of a main portion 22 of flat plate and a pair of mounting 23 which are located at both ends of the said elongated main portion 22. The main portion 22 is provided with the maximum required number of terminals 24 which are tightly fastened thereto, while there are formed a plurality of slits 26 on one side of the main portion 22. The said pair of mounting 23 are molded integral with the main portion 22 having an opening 27 respectively, which extends through the full height of the mounting 23. The said opening may be formed in any shape such as circle, rectangle

etc. It is to be noted that the reference character *a* denotes a wall thickness of the mounting 23.

Further the reference numeral 28 denotes a pair of antenna supporting members which are to be securely mounted on the terminal board 21. The antenna supporting member 28 is made of resilient plastic material having some resiliency, which does not need particular heat resisting characteristics. The antenna supporting member 28 is provided with a supporting portion 30 above the resilient portion 29, in which an antenna is to be carried, and an insert or connector portion 31 extends downward to be fit into the opening 27 of the mounting 23. To make sure of the required resiliency at the resilient portion 29 there are formed elongated cutout 32, of which width and length are to be determined in accordance with the resiliency of the material used. The said elongated cutout 32 serves also for reducing shrinkage of the plastic material, which is caused after completion of molding of the antenna supporting member 28. The supporting portion 30 is formed to a ring through which a rod of ferrite core 33 is inserted and fastened thereto. In order that the ferrite core 33 is tightly fastened in the said supporting portion 30, the same is adapted to be plated thereover to the predetermined film thickness and/or provided with a notch 34 in place on the inner surface thereof. The insert or connector portion 31 is molded to a rectangular column, of which cross section corresponds to that of the opening 27 of the mounting 23, and is tightly secured in the opening 27 by way of an arrangement that the outer dimension of the connector portion is a little larger than the inner dimension of the opening or another arrangement that there is provided an elongated protrusion 35 in place on the side face of the insert or connector portion. It is to be noted that the illustration in Fig. 6 is the case that there are provided two pieces of mounting 23 but the number of the mounting 23 need not be limited only to two.

In operation of the antenna coil support constructed in accordance with the present invention, as mentioned above, the antenna supporting member 28 is held on the mounting 23 in such a manner that the shoulder 36 comes in abutment with the upper face of the mounting 23, and then an antenna coil 37 is inserted through the opening of the supporting portion 30 so that the said antenna coil is securely mounted on the antenna support. In the meantime the lead wires 38 of the antenna coil 37 are led to the terminals 24 through the slits 26.

When the antenna coil is assembled with the terminal board with the aid of the antenna coil support in accordance with the present invention, the terminal board 21 and antenna supporting member 28 may be previously assembled prior to placing the antenna coil, but it is preferable that the ferrite core 33 is inserted through the antenna supporting member 28 at the same time as it is inserted through the coil 39 but just before connecting the lead wire to the terminal 24, because this prevents any occurrence that other antenna coil may be damaged by the terminal 24 or the terminal 24 is deformed or bent during assembling operation.

Owing to the antenna coil support in accordance

with the present invention, the antenna coil 37 can be satisfactorily fastened onto the antenna supporting member 28 and terminal board 21 and subsequently the terminal board 24 can be tightly mounted on the printed board. Further owing to the fact that the terminal board 21 is made of heat resisting material and the antenna supporting member 28 is of plastic material having high resiliency, there is provided an antenna coil support with high shock absorbability, by means of which soldering operation can be easily and conveniently conducted. It is to be pointed out as another advantageous feature of the invention that it is possible to some extent without renewal or modification of the existing molding die to adjust the height from the bottom of the terminal board 21 to the antenna coil 37 by arranging a spacer means such as washer or the like beneath the said shoulder 36, and that even if it is required to change substantially the said height, all that is to be done is only to manufacture another new molding die for the antenna supporting member 28, which means that modification can be accomplished at inexpensive cost. Moreover in case that the diameter and shape of the ferrite core 33 are to be changed, it is required only to modify the molding die for the antenna supporting member 28 at inexpensive cost.

Next Fig. 8 shows an antenna coil with terminal board in accordance with another embodiment of the present invention. In the drawing the reference numeral 40 denotes a terminal board made of heat resisting plastic material, the said terminal board 40 being provided with a plurality of mounting 42, as illustrated in Fig. 9, through which an opening extends in the vertical direction, the said mounting 42 being molded integral with the terminal board 40. Further the said terminal board 40 is provided with the maximum number of terminals 43 which are tightly fastened thereto, while there are formed a series of slits 45 on one side of the terminal board 40. In the drawing the reference numeral 46 denotes an antenna supporting member which is molded with the use of plastic material having high shock absorbability and appropriate flexibility or resiliency. It should be noted that the said antenna supporting member 46 is not necessarily made of heat resisting plastic material. As illustrated in Fig. 10, the said antenna supporting member 46 comprises an annular antenna supporting portion 47 at its upper part and an insert or connector portion 48 at its lower part, which is adapted to be inserted into the opening 41 of the mounting 42. Further the said insert or connector portion 48 is provided with engagement latch 49 at the lower part thereof, which serves to prevent this portion 48 from being loosened out of the opening 41. In Fig. 10 the reference numeral 50 denotes an elongated protrusion 48 located around at the upper part of the insert or connector portion 48.

Thus an antenna coil with terminal board is constructed in such a manner that the insert or connector portion 48 of the antenna supporting member 46 is inserted into the opening 41 of the mounting 42 which is molded integral with the terminal board 40, while the antenna coil 51 is inserted through the opening of the antenna supporting member. The

lead wires 52 are connected to the terminals 43 through the slits 45 on the terminal plate 40. In operation the whole assembly is mounted on the printed board 19, as illustrated typically in Fig. 5.

Since the antenna coil constructed in accordance with the present invention has the antenna supporting member 46 and the terminal plate 40 which are separate from each other, the lead wire of the antenna coil and the terminal are soldered together when the insert or connector portion 48 of the antenna supporting member 46 is provisionally inserted halfway in the opening 41 of the mounting 42, and then it is fully inserted in the opening 41 after completion of soldering operation. Owing to the arrangement as mentioned above, there is provided a engagement latch 49 without little damage due to exposure to heat during assembling operation, and moreover the plastic material for the antenna supporting member 46 may be selected in consideration of the resiliency of the engagement latch 49 irrespective of the terminal plate 40. When a different thickness of printed board has to be used, only the molding die for the antenna supporting member 46 may be modified. In view of the fact that, however, the insert or connector portion 48 of the antenna supporting member 46 can be fully inserted in the opening 41 with much force applied thereon but it may be held a little before full inserting where the elongated protrusion comes in engagement with the inlet portion of the opening 41, any little difference in thickness of the printed board can be easily compensated only by way of adjusting the amount to which the insert or connector portion 48 is inserted into the opening 41. As mentioned above, the antenna support in accordance with the present invention can adapt itself economically to any minor change or modification of the printed board or the other owing to the arrangement of the heat resisting terminal plate and the resilient support means.

Fig. 11 and 12 show an antenna coil in accordance with further another embodiment of the present invention, while Fig. 13 and 14 shows that in accordance with still further another embodiment of the present invention, wherein Fig. 11 and 13 illustrate the antenna coil in the completely assembled state, while Fig. 12 and 14 illustrate how the antenna coil is being assembled.

As illustrated in these drawings, the antenna coil in accordance with the present invention is constructed such that the antenna supporting members 58 and 59 are fit in and fastened to the openings 56 and 57 of the mounting 54 and 55 respectively, which stand upright from the terminal board 53. The said antenna supporting members 58 and 59 are provided at the lower part thereof with engagement means 60 and 61 and engagement latch 62 and 63 so as to enable them to be tightly fastened to the terminal board and printed board, the former engagement means 60 and 61 serving to fastening by way of its sideway expansion against the inner wall of the opening, while the latter engagement latches 62 and 63 serving to fastening by way of expansion and engagement to the printed board in a one-touch manner. As illustrated in the drawings, the antenna supporting members 58 and 59 are molded sepa-



ately from the terminal board 53 respectively and their material is selected in view of its vibration-resistibility rather than heat-resistibility. Further it is an ordinary practice that there is provided a hollow portion in the antenna supporting member so as to increase in its shock-resistibility.

The antenna supporting member 58 has an opening 65 through which the ferrite core 64 is fit and fastened, while the antenna supporting member 59 has another opening 66 through which the said ferrite core 64 is fit. And the said antenna supporting member 59 is provided with a tubular coil bobbin 67 on which coil is to be wound, the said coil bobbin being molded integral with the antenna supporting member 59. Incidentally the reference numeral 68 in the drawings denotes another coil bobbin which is located free from the said both antenna supporting members 58 and 59.

Owing to the fact that the coil bobbin 67 is molded integral with the antenna supporting member 59 which has high vibration-resistibility as well as high shock-resistibility and the ferrite core 64 is carried in the said antenna supporting member 59, breakage trouble with the ferrite core 64 is remarkably reduced, which is caused by dropping, shock or the like.

In the embodiments of the invention as illustrated in Fig. 11 to 14, the antenna supporting members 58 and 59 are molded separately from the terminal board 53. The present invention, however, need not be limited only to this arrangement as illustrated in these drawings and it may be advantageously applicable even in case that the antenna supporting members 58 and 59 are molded integral with the terminal plate 53.

#### CLAIMS

1. An antenna coil support means characterised in that it comprises a terminal board made of heat resisting plastic material, the said terminal board being provided with a plurality of mountings through which an opening extends in the vertical direction, and antenna supporting members having an antenna supporting portion at the upper part thereof and an insert or connector portion at the lower part thereof, the latter being adapted to be fit and fastened in the said opening of the said mounting.

2. An antenna coil with a terminal board comprising a terminal board and antenna supporting members characterised in that the said antenna supporting member is provided at the lower part thereof with an engagement latch which is moulded integral with the said antenna supporting member, the said engagement latch serving to prevent the antenna supporting member from being loosened from the terminal board.

3. An antenna coil with a terminal board characterised in that at the least one of the antenna supporting members is provided with a coil bobbin which extends outward or inward therefrom, the said coil bobbin being moulded integral with the said antenna supporting member.

4. An antenna coil with a terminal board as set forth in claim 3 characterised in that the antenna supporting members are moulded integral with or

separate from the terminal board.

5. An antenna coil support means as claimed in claim 1 substantially as hereinbefore described with reference to and as illustrated in Figures 6 to 14.

6. An antenna coil support means as claimed in claim 2 substantially as hereinbefore described with reference to and as illustrated in Figures 8 to 14.

7. An antenna coil as claimed in claim 3 substantially as hereinbefore described with reference to and as illustrated in Figures 11 to 14.

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